531. FACILITY DESIGN STANDARDS - DESIGN STANDARDS FOR CHEMICAL APPLICATION.

01. General Equipment Design. General equipment design shall be such that: (3-30-07)

a. Feeders will be able to supply, at all times, the necessary amounts of chemicals at an accurate rate, throughout the range of feed. (3-30-07)

b. Chemical-contact materials and surfaces are resistant to the aggressiveness of the chemical solution. (3-30-07)

c. Corrosive chemicals are introduced in such a manner as to minimize potential for corrosion. (3-30-07)

d. Chemicals that are incompatible are not stored or handled together. At facilities where more than one (1) chemical is stored or handled, tanks and pipelines shall be clearly labeled to identify the chemical they contain. (3-30-07)

e. All chemicals are conducted from the feeder to the point of application in separate conduits. (3-30-07)

f. Chemical feeders are as near as practical to the feed point. (3-30-07)

g. Chemical feeders and pumps shall operate at no lower than twenty percent (20%) of the feed range unless two fully independent adjustment mechanisms such as pump pulse rate and stroke length are fitted when the pump shall operate at no lower than ten percent (10%) of the rated maximum. (3-30-07)

h. Spare parts shall be on hand ~~available at the treatment facility~~ for parts of feeders that are subject to frequent wear and damage.

i. Redundant chemical feeders with automatic switchover shall be provided when necessary to ensure adequate treatment.

02. Facility Design. (3-30-07)

a. Where chemical feed is necessary for the protection of the supply, such as disinfection, coagulation or other essential processes, a minimum of two feeders shall be provided and a separate feeder shall be used for each chemical applied. (3-30-07)

b. Chemical application control systems shall meet the following requirements: (3-30-07)

i. Feeders may be manually or automatically controlled, with automatic controls being designed so as to allow override by manual controls. (3-30-07)

ii. Chemical feeders shall be controlled by a flow sensing device so that injection of the chemicals will not continue when the flow of water stops. (3-30-07)

iii. Chemical feed rates shall be proportional to flow. (3-30-07)

iv. A means to measure water flow must be provided in order to determine chemical feed rates. (3-30-07)

v. Provisions shall be made for measuring the quantities of chemicals used. (3-30-07)

vi. Weighing scales shall be provided for weighing cylinders at all plants utilizing chlorine gas, fluoride solution feed. (3-30-07)

vii. Weighing scales ~~S~~shall be capable of providing reasonable precision in relation to average daily dose. (3-30-07)

viii. Where conditions warrant, for example with rapidly fluctuating intake turbidity, coagulant and coagulant aid addition may be made according to turbidity, streaming current or other sensed parameter. (3-30-07)

c. Dry chemical feeders shall measure chemicals volumetrically or gravimetrically, provide adequate solution water and agitation of the chemical in the solution pot, and completely enclose chemicals to prevent emission of dust to the operating room. (3-30-07)

d. Positive displacement type solution feed pumps must be capable of operating at the required maximum head conditions found at the point of injection. (3-30-07)

e. Liquid chemical feeders shall be such that chemical solutions cannot be siphoned or overfed into the water supply, by assuring discharge at a point of positive pressure, or providing vacuum relief, or providing a suitable air gap, or providing other suitable means or combinations as necessary. (3-30-07)

f. Cross connection control must be provided to assure that the following requirements are satisfied. (3-30-07)

i. The service water lines discharging to solution tanks shall be properly protected from backflow ~~as required in Subsection 900.02 (Table 2)~~. (3-30-07)

ii. No direct connection exists between any sewer and a drain or overflow from the feeder, solution chamber or tank by providing that all drains terminate at least six (6) inches or two pipe diameters, whichever is greater, above the overflow rim of a receiving sump, conduit or waste receptacle. (3-30-07)

g. Chemical feed equipment shall be readily accessible for servicing, repair, and observation of operation. (3-30-07)

h. In-plant water supply for chemical mixing shall be: (3-30-07)

i. Ample in quantity and adequate in pressure. (3-30-07)

ii. Provided with means for measurement when preparing specific solution concentrations by dilution. (3-30-07)

iii. Properly treated for hardness, when necessary. (3-30-07)

iv. Properly protected against backflow. (3-30-07)

v. Obtained from a location sufficiently downstream of any chemical feed point to assure adequate mixing. (3-30-07)

i. Chemical storage facilities shall satisfy the following requirements: (3-30-07)

i. Storage tanks and pipelines for liquid chemicals shall be specified for use with individual chemicals and not used for different chemicals. Off-loading areas must be clearly labeled to prevent accidental cross-contamination. (3-30-07)

ii. Chemicals shall be stored in covered or unopened shipping containers, unless the chemical is transferred into an approved storage unit. (3-30-07)

~~iii. Liquid chemical storage tanks must have a liquid level indicator and have an overflow and a receiving basin capable of receiving accidental spills or overflows without uncontrolled discharge; a common~~

~~receiving basin may be provided for each group of compatible chemicals, that provides sufficient containment volume to prevent accidental discharge in the event of failure of the largest tank.~~ (3-30-07)

j. ~~Solution~~ Bulk liquid storage tanks shall comply with the following requirements: (3-30-07)

i. A means which is consistent with the nature of the chemical solution shall be provided in a solution tank to maintain a uniform strength of solution. Continuous agitation shall be provided to maintain slurries in suspension. (3-30-07)

ii. Means shall be provided to measure the liquid level in the tank. (3-30-07)

iii. ~~Chemical solutions~~ Bulk liquid storage tanks shall be kept covered. ~~Large~~ Bulk liquid storage tanks with access openings shall have such openings curbed and fitted with overhanging covers. (3-30-07)

iv. Subsurface locations for ~~solution~~ bulk liquid storage tanks shall be free from sources of possible contamination, and assure positive drainage for ground waters, accumulated water, chemical spills and overflows.(3-30-07)

v. Bulk liquid storage tanks shall be vented, but shall not vent through vents common with day tanks. Acid storage tanks must be vented to the outside atmosphere, but not through vents in common with day tanks.(3-30-07)

vi. Each bulk liquid storage tank shall be provided with a valved drain, protected against backflow ~~in accordance with Subsection 900.02 (Table 2)~~. (3-30-07)

vii. ~~Solution tanks shall be located and protective curbings provided so that chemicals from equipment failure, spillage or accidental drainage shall not enter the water in conduits, treatment or storage basins.~~Bulk liquid storage tanks shall have an overflow that is turned downward with the end screened, has a free fall discharge, and is located where noticeable. (3-30-07)

viii. Bulk liquid storage tanks shall be provided with secondary containment so that chemicals from equipment failure, spillage, or accidental drainage shall be fully contained. A common receiving basin may be provided for each group of compatible chemicals. The bulk liquid storage tank basin or the common receiving basin shall provide a secondary containment volume sufficient to hold the volume of the largest storage tank. Piping shall be designed to minimize or contain chemical spills in the event of pipe ruptures.

ix. Where chemical feed is necessary for the protection of the supply, a means to assure continuity of chemical supply while servicing a bulk liquid storage tank shall be provided.

k. For the purposes of Section 531, day tanks are defined as liquid chemical tanks holding no more than a thirty (30) hour chemical supply. Day tanks are subject to the following requirements:

i. Day tanks shall be provided where bulk storage of liquid chemicals are provided. The Department may allow chemicals to be fed directly from shipping containers no larger than fifty-five (55) gallons.

ii. Day tanks shall meet all the requirements of Subsection 531.j., with the exception of Subsection 531.j.viii. Shipping containers do not require overflow pipes or drains as required by Subsection 531.j. and are not subject to the requriements of Subsection 531.j.viii.

iii. Where practicable, secondary containment shall be provided so that chemicals from equipment failure, spillage, or accidental drainage of day tanks shall be fully contained. A common receiving basin may be provided for each group of compatible chemicals. The common receiving basin shall provide a secondary containment volume sufficient to hold the volume of the largest storage tank. If secondary containment is not practicable, day tanks shall be located and protective curbings provided so that chemicals from equipment failure, spillage, or accidental drainage of day tanks shall not enter the water in conduits, treatment, or storage basins.

iv. Day tanks and the tank refilling line entry points shall be clearly labeled with the name of the chemical contained.

~~k~~l. Provisions shall be made for measuring quantities of chemicals used to prepare feed solutions. (3-30-07)

~~l~~m. Vents from feeders, storage facilities and equipment exhaust shall discharge to the outside atmosphere above grade and remote from air intakes. (3-30-07)

03. Chemicals. Chemical shipping containers shall be fully labeled to include chemical name, purity and concentration, supplier name and address, and evidence of ANSI/NSF certification where applicable. (3-30-07)

04. Safety Requirements for Chemical Facilities. (3-30-07)

a. The following requirements apply to chlorine gas feed and storage rooms: (3-30-07)

i. Each storage room shall be enclosed and separated from other operating areas. They shall be constructed in such a manner that all openings between the chlorine room and the remainder of the plant are sealed, and provided with doors equipped with panic hardware, assuring ready means of exit and opening outward only to the building exterior. (3-30-07)

ii. Each room shall be provided with a shatter resistant inspection window installed in an interior wall. (3-30-07)

iii. Each room shall have a ventilating fan with a capacity which provides one (1) complete air change per minute when the room is occupied. Where this is not appropriate due to the size of the room, a lesser rate may be allowed by the Department on a site specific basis. (3-30-07)

iv. The ventilating fan shall take suction near the floor as far as practical from the door and air inlet, with the point of discharge so located as not to contaminate air inlets to any rooms or structures. Air inlets shall be through louvers near the ceiling. (3-30-07)

v. Louvers for chlorine room air intake and exhaust shall facilitate airtight closure. (3-30-07)

vi. Separate switches for the fan and lights shall be located outside of the chlorine room and at the inspection window. Outside switches shall be protected from vandalism. A signal light indicating fan operation shall be provided at each entrance when the fan can be controlled from more than one (1) point. (3-30-07)

vii. Vents from feeders and storage shall discharge to the outside atmosphere, above grade. (3-30-07)

viii. Where provided, floor drains shall discharge to the outside of the building and shall not be connected to other internal or external drainage systems. (3-30-07)

ix. Chlorinator rooms shall be heated to sixty degrees farenheit (60°F) and be protected from excessive heat. Cylinders and gas lines shall be protected from temperatures above that of the feed equipment. (3-30-07)

x. Pressurized chlorine feed lines shall not carry chlorine gas beyond the chlorinator room. (3-30-07)

xi. Critical isolation valves shall be conspicuously marked and access kept unobstructed. (3-30-07)

xii. All chlorine rooms, buildings, and areas shall be posted with a prominent danger sign warning of the presence of chlorine. (3-30-07)

xiii. Full and empty cylinders of chlorine gas shall be isolated from operating areas and stored in definitely assigned places away from elevators, stairs, or gangways. They shall be restrained in position to prevent being knocked over or damaged by passing or falling objects. In addition, they shall be stored in rooms separate

from ammonia storage, out of direct sunlight, and at least twenty (20) feet from highly combustible materials. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards. (3-30-07)

b. Where acids and caustics are used, they shall be kept in closed corrosion-resistant shipping containers or storage units. Acids and caustics shall not be handled in open vessels, but shall be pumped in undiluted form from original containers through suitable hose to the point of treatment or to a covered day tank. (3-30-07)

c. Sodium chlorite for chlorine dioxide generation. Proposals for the storage and use of sodium chlorite shall be approved by the Department prior to the preparation of final plans and specifications. Provisions shall be made for proper storage and handling of sodium chlorite to eliminate any danger of fire or explosion associated with its oxidizing nature. (3-30-07)

i. Chlorite (sodium chlorite) shall be stored by itself in a separate room. It must be stored away from organic materials. The storage structure shall be constructed of noncombustible materials. If the storage structure must be located in an area where a fire may occur, water must be available to keep the sodium chlorite area cool enough to prevent heat-induced explosive decomposition of the chlorite. (3-30-07)

ii. Care shall be taken to prevent spillage. An emergency plan of operation shall be available for the clean up of any spillage. Storage drums shall be thoroughly flushed prior to recycling or disposal. (3-30-07)

d. Where ammonium hydroxide is used, an exhaust fan shall be installed to withdraw air from high points in the room and makeup air shall be allowed to enter at a low point. The feed pump, regulators, and lines shall be fitted with pressure relief vents discharging outside the building away from any air intake and with water purge lines leading back to the headspace of the bulk storage tank. (3-30-07)

e. Where anhydrous ammonia is used, the storage and feed systems (including heaters where required) shall be enclosed and separated from other work areas and constructed of corrosion resistant materials. (3-30-07)

i. Pressurized ammonia feed lines shall be restricted to the ammonia room. (3-30-07)

ii. An emergency air exhaust system, as described in Subsection 531.04.a., but with an elevated intake, shall be provided in the ammonia storage room. (3-30-07)

iii. Leak detection systems shall be fitted in all areas through which ammonia is piped. (3-30-07)

iv. Special vacuum breaker/regulator provisions must be made to avoid potentially violent results of backflow of water into cylinders or storage tanks. (3-30-07)

v. Consideration shall be given to the provision of an emergency gas scrubber capable of absorbing the entire contents of the largest ammonia storage unit whenever there is a risk to the public as a result of potential ammonia leaks. (3-30-07)

05. Operator Safety. The Idaho General Safety and Health Standards, referenced in Subsection 002.02, may be used as guidance in designing facilities to ensure the safety of operators. The following requirements are in addition to the requirements of Subsection 501.12. (3-30-07)

a. Respiratory protection equipment, meeting the requirements of the National Institute for Occupational Safety and Health (NIOSH) shall be available where chlorine gas is handled, and shall be stored at a convenient heated location, but not inside any room where chlorine is used or stored. The units shall use compressed air, have at least a thirty (30) minute capacity, and be compatible with or exactly the same as units used by the fire department responsible for the plant. (3-30-07)

b. Chlorine leak detection. A bottle of concentrated ammonium hydroxide (fifty-six (56) per cent ammonia solution) shall be available for chlorine leak detection. Where ton containers are used, a leak repair kit approved by the Chlorine Institute shall be provided. (3-30-07)

c. Protective equipment. (3-30-07)

i. At least one pair of rubber gloves, a dust respirator of a type certified by NIOSH for toxic dusts, an apron or other protective clothing, and goggles or face mask shall be provided for each operator. (3-30-07)

ii. A deluge shower and eyewashing device shall be installed where strong acids and alkalis are used or stored. A water holding tank that will allow water to come to room temperature shall be installed in the water line feeding the deluge shower and eyewashing device. Other methods of water tempering will be considered on an individual basis. (3-30-07)

iii. ~~A water holding tank that will allow water to come to room temperature shall be installed in the water line feeding the deluge shower and eyewashing device. Other methods of water tempering will be considered on an individual basis.~~For chemicals other than strong acids and alkalis, an appropirate eye washing device or station shall be provided. (3-30-07)

iv. Other protective equipment shall be provided as necessary. (3-30-07)

06. Design Requirements for Specific Applications. In addition to Subsection 531.01 through 531.03, the following design requirements apply for the specific applications. (3-30-07)

a. Sodium chlorite for chlorine dioxide generation. Positive displacement feeders shall be provided. Tubing for conveying sodium chlorite or chlorine dioxide solutions shall be Type 1 PVC, polyethylene or materials recommended by the manufacturer. Chemical feeders may be installed in chlorine rooms if sufficient space is provided. Otherwise, facilities meeting the requirements of chlorine rooms shall be provided. Feed lines shall be installed in a manner to prevent formation of gas pockets and shall terminate at a point of positive pressure. Check valves shall be provided to prevent the backflow of chlorine into the sodium chlorite line. (3-30-07)

b. ~~Sodium h~~Hypochlorite facilities shall meet the following requirements: (3-30-07)

i. ~~Sodium h~~Hypochlorite shall be stored in the original shipping containers or in ~~sodium~~ hypochlorite compatible containers. Storage containers or tanks shall be sited out of the sunlight in a cool and ventilated area. (3-30-07)

ii. Stored hypochlorite shall be pumped undiluted to the point of addition. Where dilution is unavoidable, deionized or softened water shall be used. (3-30-07)

iii. Storage areas, tanks, and pipe work shall be designed to avoid the possibility of uncontrolled discharges and a sufficient amount of appropriately selected spill absorbent shall be stored on-site. (3-30-07)

iv. ~~Sodium h~~Hypochlorite feeders shall be positive displacement pumps with compatible materials for wetted surfaces. (3-30-07)

v. To avoid air locking in smaller installations, small diameter suction lines shall be used with foot valves and degassing pump heads. In larger installations flooded suction shall be used with pipe work arranged to ease escape of gas bubbles. Calibration tubes or mass flow monitors which allow for direct physical checking of actual feed rates shall be fitted. (3-30-07)

vi. Injectors shall be made removable for regular cleaning where hard water is to be treated. (3-30-07)

c. When ammonium sulfate is used, the tank and dosing equipment contact surfaces shall be made of corrosion resistant non-metallic materials. Provision shall be made for removal of the agitator after dissolving the solid. The tank shall be fitted with a lid and vented outdoors. Injection of the solution should take place in the center of treated water flow at a location where there is high velocity movement. (3-30-07)

d. When aqua ammonia (ammonium hydroxide) is used, the feed pumps and storage shall be enclosed and separated from other operating areas. The aqua ammonia room shall be equipped as required for chlorinator rooms with the following changes: (3-30-07)

i. A corrosion resistant, closed, unpressurized tank shall be used for bulk storage, vented through an inert liquid trap to a high point outside and an incompatible connector, or lockout provisions shall be made to prevent accidental addition of other chemicals to the storage tank. (3-30-07)

ii. The storage tank shall ~~be fitted either with cooling/refrigeration and/or with provision without opening the system to dilute and mix the contents with water to~~ be designed to avoid conditions where temperature increases cause the ammonia vapor pressure over the aqua ammonia to exceed atmospheric pressure. This capability can be provided by cooling/refrigeration or diluting or mixing the contents with water without opening the system. (3-30-07)

iii. The aqua ammonia shall be conveyed direct from storage to the treated water stream injector without the use of a carrier water stream unless the carrier stream is softened. (3-30-07)

iv. The point of delivery to the main water stream shall be placed in a region of turbulent water flow. (3-30-07)

v. Provisions shall be made for easy access for removal of calcium scale deposits from the injector. (3-30-07)